Development of novel nano-structural catalysts for environment friendly production of liquid fuels

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Practical synthesis technologies for energy-carrying liquid methanol from C_1 fossil sources are desired to meet the demand of a low-carbon existing environment. A key problem is finding a solid catalyst with satisfactory activity at low temperatures. Microstructural modified Cu/MgO catalysts by the addition of La_2O_3 were prepared and characterized in order to improve their activity for methanol synthesis from industry-like feedgas $CO/CO_2/H_2$ at as low temperature as 423K. The dispersion on MgO surface of metal Cu was increased as the particle size of metal Cu reduced due to the addition of La_2O_3. The conversion of CO and CO_2 were thus raised and showed durable for potassium salt and catalytically active alcohol solvent promoted homogeneous-heterogeneous synthesis system.

The energy-oriented utilization of non-food biomass has been a hotspot topic since 2000 to develop carbonneutral energy sources. The conversion of cellulose in plant biomass is viewed as a promising platform to obtain biofuel and chemicals. The conventional processing of biomass via microorganism fermentation in fact accompanies the high release of CO_2 when ethanol is produced. Catalytic process technologies are environmentally benign and will find place in this energy change course. Heterogeneous bifunctional catalysts were employed to explore new routes for the conversion of rice straw to valuable chemicals. Low-temperature steam reforming unit was coupled into the newly-developed hydrothermal hydrogenoloysis of cellulose. Sugar alcohol and non-sugar alcohol products were obtained under the high conversion of both cellulose and rice straw. Intensified hydrogen environment favored the utilization of rice straw through simpler and more practical methods.

Keywords: liquid fuels, nanocatalysts, environment benign

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